STATEMENT OF

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ON

THE MARINE MAMMAL PROTECT ACT AND SURVEILLANCE TOWED ARRAY SENSOR SYSTEM LOW FREQUENCY ACTIVE SONAR

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Testimony of Vice Admiral McGinn

Good afternoon Chairman Gilchrest, Delegate Underwood, members of the Fisheries Conservation, Wildlife and Oceans Subcommittee, and ladies and gentlemen. I am here today to provide testimony on Navy Sonar, the Surveillance Towed Array Sensor System Low Frequency Active, or SURTASS LFA sonar, the Marine Mammal Protection Act and future Navy research into the effects of underwater sound on the marine environment. As the Director of Warfare Requirements and Programs, I am responsible for equipping our sailors with the most capable weapon system so that they can carry out their missions in most effective manner. This is my duty under the President, the Commander in Chief, and I mean to fulfill that obligation to the best of my ability. The topic I am here to address today is very important to fulfilling that charge. That duty took on new relevance one month ago today (September 11, 2001). While the Navy takes its environmental responsibility seriously, working to protect and enhance natural resources and endangered species in our fleet operating areas and training ranges, there must be a balance between environmental concerns and our national security. We are ready today to help defend this nation, but current regulatory trends and litigation are worrisome. Our ability to work around environmental challenges is not infinite and our future readiness could be placed at risk.

The United States Navy has used SOund NAvigation Ranging or "SONAR" for more than five decades. Sonar is generally broken into two methods of use, active and passive. Active sonar is a signal or "ping" transmitted and then a reflection of that sound is received. Passive is simply listening for sounds emitted by ships or submarines, such as engine vibrations. Active sonar can be divided into 3 categories; low (< 1kHz), medium (1kHz-10kHz) and high frequency (>10kHz). The lower the frequency, the less the signal and the return are attenuated as they pass through the water column and the further a they will travel. We currently operate several variants of our standard hull mounted mid-ranged sonar on both surface ships and submarines. These have been in use since the later 1960s. We also use sonar to detect mines, to guide torpedoes and other weapon systems. We use it on fathometers to measure ocean depth, to perform oceanographic mapping, for navigation, and to find shipwrecks. We use systems similar to sonar for underwater communications, to measure global warming, and many other types of research. We have a great deal of experience with sonar and have rarely observed any significant adverse effect on the environment. Sonar is an extremely vital source of information, and most importantly, it allows us to keep our sons and daughters out of harms way.

My staff and I have studied the relevant data and information on SURTASS LFA--we have read the Environmental Impact Statement (EIS), listened to briefings from the sponsor and program office and, of course, have read counter-arguments from environmental organizations on why the Navy should abandon SURTASS LFA. My testimony today is divided into four sections:

· There is an immediate and critical national security need for the SURTASS LFA technology in the Fleet's arsenal. The Chief of Naval Operations and the Fleet Commander in Chiefs have reviewed and validated the urgent military need for this sensor system.

· The SURTASS LFA EIS is the most comprehensive and exhaustive scientifically-based EIS ever undertaken by the Navy for a major seagoing combat system. This will be clear when I take you through each step of the EIS process that we have been conducting since 1996.

· Next, I will address the extensive scientific research, studies and analyses that went into the EIS process and, most importantly, the conclusions reached by the independent scientists that conducted the research.

· Finally, the Navy is planning to implement a long term monitoring plan, which will continue independent research on possible effects from underwater low frequency sound. The bottom line: SURTASS LFA can be operated safely and effectively.

1. The Navy has an immediate, critical need for SURTASS LFA. By law, the Navy's primary mission is to maintain, train and equip combat-ready Naval forces capable of winning wars, deterring aggression and maintaining freedom of the seas. Antisubmarine warfare, or ASW, is a critical part of that mission. The Chief of Naval Operations (CNO) has stated that ASW is essential to sea control and maritime dominance. Many nations throughout the world can employ submarines to deny access to forward regions or to significantly delay the execution of crucial Navy operations. Because of its inherent stealth, lethality, and affordability, the submarine is a powerful threat. In 1998 the Chief of Naval Operations emphasized the importance of ASW in protecting our national security and set the direction for achieving operational primacy in ASW. He stated that the Navy's goal is to have the best-trained ASW force in the world, with the right set of tools to prevail in any type of conflict, including the kind we are now facing in the Middle East. My goal here today is to show you why I believe one of the primary ASW tools must be SURTASS LFA.

Many of the opponents of SURTASS LFA say that the Cold War is over and question the need for the SURTASS LFA system. Despite the end of the Cold War, the submarine threat remains real and in some ways has become more challenging. Of the approximately 500 non-U.S. submarines in the world, 224 are operated by non-allied nations. Many of these are the more advanced, quieter diesel-electric submarines that present a real threat to U.S. forces. The Russian Federation and the People's Republic of China have publicly declared that the submarine is the capital ship of their navies. Many potential adversarial countries have essentially done the same, including Iran and North Korea. A former Indian Navy submarine admiral has commented that developing nations desire submarine forces because they are the most cost-effective platform for the delivery of several types of weapons; they counter surface forces effectively; they are flexible, multi-mission ships; they are covert and can operate with minimal political ramifications; and they can operate without supporting escorts. Submarines are ideal weapons for states that lack, or cannot afford, the capability to assert sea control in their own (or others') waterspace. They can operate in an opponent's backyard. Even in the face of determined sea control efforts, they can conduct stealthy and intrusive operations in sensitive areas, and can be inserted early for a wide range of tasks with a high degree of assured survivability. When equipped with mines, advanced torpedoes, anti-ship or land-attack missiles, a submarine is a potent tactical and political weapon. Ladies and gentlemen, in today's unpredictable world, we must recognize that the advanced, quiet submarine is potentially a terrorist threat. A single diesel-electric submarine that is able to penetrate U.S. or multinational task force's defenses could easily undermine military efforts to thwart hostile enemy forces and change the balance of political support for U.S. involvement in armed conflict.

A recent U.S.-Australian ASW exercises with the new Australian *Collins*-class diesel-electric submarine demonstrated that new technology is needed to detect a modern diesel-electric submarine operating on battery power. We have to reduce the limits of detection for the submarines of today and tomorrow, and SURTASS LFA does that. Nations of concern continue to build and sell new classes of highly capable submarines, and to operate its newest vessels outside of home waters.

These nations are also investing heavily in submarine technology, including designs for nuclear attack submarines, strategic ballistic missile submarines, and advanced diesel-electric boats. The President's National Research Council has projected that by 2035, U.S. military forces may be seriously and competently challenged by submarines from major powers like Russia and China, or from a number of potentially unfriendly nations. By 2030, it is projected that 75 percent of the non-U.S. submarines will have advanced capabilities, including air-independent propulsion that allows 30-50 days of submerged operations without surfacing or snorkeling. When these units are in a defensive mode, that is, not having to travel great distances or at high speed, they have a capability nearly equal to that of a modern U.S. nuclear submarine. At minimal cost, this capability can be readily obtained, including highly capable weapons, in some cases consisting of nuclear devices.

Quieting technology continues to proliferate, which will render these advanced diesel submarines difficult, if not nearly impossible to detect, even with the latest passive sonar equipment. This is where SURTASS LFA comes in--its state-of-the-art towed array provides the Navy with the world's best deep and shallow-water (littoral zone) low frequency passive acoustic sensor, called SURTASS. When SURTASS by itself proves inadequate in detecting and tracking submarines, its active component, LFA, is used--which is a set of acoustic transmitting source elements suspended by cable beneath the ship. These elements, called projectors, produce the active sound pulse, or "ping," which allows for such long-range detections of otherwise concealed submarines. Its extended detection ranges are achieved using low-frequency signals in the 100-500 Hertz frequency band, and high-gain receivers in the SURTASS towed array to pick up the returning echoes from the ping reflecting off the target submarine. Thus, SURTASS LFA meets the U.S. need for improved capability to detect quieter and hard-to-find foreign submarines at long range, and provides adequate time to react to and defend against potential submarine threats.

As an example of the importance of ASW, we need only return to the 1982 Falklands conflict. The Royal

Navy established regional maritime dominance in the Falklands with a single submarine attack, the sinking of the Argentine cruiser *General Belgrano* by the nuclear-powered attack submarine *Conquerer*. Had the single Argentine Type 209 diesel-electric submarine that got underway been successful in just one of several attacks and sank or seriously damaged one of the British small-deck aircraft carriers or logistics ships, the outcome of that conflict might have been very different.

The Navy chose to develop LFA sonar because it is superior to alternative technologies. Examination of the potential threat led Navy to identify a need for long-range detection, before a hostile submarine could maneuver into its weapon-release range. The use of conventional technologies to accomplish this is infeasible from tactical and economic perspectives. The Navy also recognized that passive sonar would be insufficient for long-range detection against advanced submarines.

The Navy also studied several non-acoustic ASW technologies in the 1980's as potential candidates for use in detecting submarines, including radar, laser, magnetic, infrared, electronic, electric, hydrodynamic, and biologic detection systems. While some of these have demonstrated limited utility in detecting submarines, none has provided U.S. forces with long-range detection and the necessary longer reaction times.

The Navy concentrated on LFA because it is well established that low frequency sounds (below 1,000 Hertz) propagate in seawater more effectively and at greater distances than mid-frequencies (1,000 to 10,000 Hertz) and high frequencies (10,000 to 100,000 Hertz). The Navy's evaluation of how LFA sonar could be configured and employed to provide for long-range submarine detection.

The SURTASS LFA EIS is the most comprehensive and exhaustive scientifically-based EIS ever undertaken by the Navy for a major seagoing combat system. Moreover, the Navy has gone to virtually unprecedented lengths to inform and involve the public. Since the release of the Notice of Intent in the Federal Register five years ago, the Navy has held three public scoping meetings in 1996, eight public outreach meetings in 1997-98, and three public hearings on the Draft EIS in 1999. Written and oral comments on the Draft EIS were received from over 1,000 commentors, including federal, state, regional and local agencies, environmental groups and associations, as well as private individuals. In addition, the Navy established the SURTASS LFA Scientific Working Group in 1997. This distinguished panel was made up of independent scientists from a wide variety of marine laboratory and academic organizations, as well as a representative from the non-governmental environmental groups opposed to LFA. The panel met periodically to determine the critical data gaps that needed to be addressed to evaluate the effects of low frequency sound on the marine environment, and to review the results from the SRP field experiments.

The Navy is the lead agency for the proposed action, with NOAA Fisheries acting as cooperating agency due to their expertise on marine mammal issues. At the outset of the process, the Navy delineated five Principles for development of the EIS:

1. Conduct scientific studies on the potential effects of low frequency sound on marine life and human divers.

2. Maintain scientific rigor throughout development of the EIS.

3. Use an independent scientific team to review and edit the EIS.

4. Preserve an open process with maximum public engagement.

5. Provide adequate funding for scientific research to address critical data gaps and furnish a meaningful and understandable EIS to the public.

The Analytical Process for development of the EIS included the following:

1. Scientific literature review and determination of data gaps.

2. Scientific screening of marine animal species for potential sensitivity to low frequency sound.

3. Scientific research on the effects of low frequency sound on humans in water and marine mammals.

4. Development of a scientific method for quantifying risk to marine mammals.

5. Analytical acoustic modeling of representative cases for the deployment of SURTASS LFA.

6. Estimation of marine mammal stocks potentially affected and the effects on fish and sea turtles.

7. Establishment of mitigation and monitoring to minimize effects to a negligible level.

In developing the framework for the EIS, the Navy recognized that it needed to address some outstanding issues. First, there were concerns over the adequacy of scientific information on the impacts of LFA sounds upon human divers. Because data on the effects of low frequency sound on humans is limited, the Navy sponsored independent scientific research to study the effects of low frequency sound on human divers. This research was conducted by the Office of Naval Research and the Naval Submarine Medical Research Laboratory, in conjunction with scientists from the University of Rochester, Georgia Institute of Technology, Boston University, the University of Pennsylvania, Duke University, the Applied Research Laboratory, the University of Texas, and Divers Alert Network. Based upon the results of this research, the Naval Submarine Medical Research Laboratory--the same organization responsible for the dive tables used by all recreational and commercial divers-- established a 145-dB received level criterion for recreational and commercial divers.

There was also the issue over the adequacy of scientific information on the impacts of sound upon marine animals. Because data on the effects of low frequency sound on marine animals in general, and particularly on certain sensitive marine mammals species, is limited, the Navy conducted a series of original scientific field research projects to address the data gaps on the effects of low frequency sound on the marine environment.

Recognized world experts in the fields of marine biology and bioacoustics were allowed to independently plan and organize a series of Navy-sponsored scientific field research projects to address the most critical of the data gaps on the effects of low frequency sound on the behavioral responses of free-ranging marine mammals. This research effort was the 1997-98 Low Frequency Sound Scientific Research Program, or SRP. The goal of the SRP was to evaluate avoidance reactions to SURTASS LFA sounds by sensitive species during critical biological behaviors. At the time of the SRP field tests, the prevailing theory was that a 140 dB received level would drive marine mammals away. Testing was conducted in three phases:

a) Phase I was conducted with blue and fin whales feeding off the southern California coast, using three research vessels, including the *Cory Chouest* with the LFA system on it, small aircraft for aerial surveys, autonomous seafloor acoustic recording units, and the Navy's sound surveillance system, or SOSUS. This was the most extensive real-world field experiment using large baleen whales that has ever been undertaken.

Initial analysis of SRP Phase I data indicated a slight decrease in whale vocal activity during LFA transmissions. However, subsequent, more detailed analysis using data from all three types of passive receivers on ships and the seafloor showed no significant differences in vocal activity between the LFA transmission periods and the non-transmission periods.

b) Phase II was conducted with gray whales migrating southward along the central California coast, using a boat with a single LFA source element deployed over-the-side, an observation boat with hydrophones deployed over-the-side to verify received levels at the whales, and shore observers using state-of-the-art theodolite telescopes to track the whales. Phase II was conducted by some of the same scientists who conducted similar testing in 1983 and 1984, which showed the gray whales reacting to 120 dB received levels. During Phase II, when the sound source was placed directly in the path of the migrating gray whales, they showed a modest avoidance reaction by deflecting a few hundred yards around the source at received levels of 138 to 144 dB. However, when the source was moved one nautical mile farther out to sea and the source level adjusted so that the exposure level at the animals in the migration corridor remained the same, the whales did not exhibit avoidance of the signal.

c) Phase III was conducted with breeding humpback whales off the Kona coast of the Big Island of Hawaii, using *Cory Chouest* with the LFA system, a Navy SURTASS ship with its passive towed array, an observation boat to verify received levels at the whales, and shore observers with theodolite telescopes. During Phase III, about half of the singing humpback whales showed what at first appeared to be avoidance level responses and cessation of singing when exposed to LFA signals at received levels of 120-155 dB. However, an equal number of singing whales exposed to the same levels of LFA signals showed no avoidance or cessation of song. Of the whales that did stop singing, there was little response to subsequent LFA transmissions, as most joined with other whales or resumed singing within less than an hour of exposure to the LFA sounds. Those that did not stop singing, sang longer songs during LFA transmissions, and returned to their baseline levels after LFA transmissions stopped. The independent scientists who designed and conducted this experiment determined that this brief interruption, followed by resumption of normal interactions, is similar to that seen when whales interrupt one another or when small vessels, like whale-watching boats, approach an animal. If whales are in a breeding habitat and such vessel interactions are frequent, the aggregate impact of all disruptive stimuli could effect significant biological functions. However, LFA will be operated well offshore of humpback breeding areas. It is highly likely that the cumulative impact of numerous inshore vessel interactions will cause significantly greater impact on these animals than that caused by infrequent offshore LFA transmissions.

In summary, this $10 million SRP, conducted independently by world-renowned marine biologists and bio-acousticians, collected much-needed data on the reaction of marine mammals considered to be most susceptible to low frequency sounds--baleen whales. The results of these field studies led to the determination that the LFA sonar system could be operated safely with the restrictions and mitigation proposed in the EIS.

<u>SURTASS LFA can be operated safely and effectively.</u>

Marine mammals are constantly exposed to natural and man-made underwater sounds. We must look at the range of effects and the factors that are likely to cause responses in marine mammals. A sound must be perceived by the animal to evoke any behavioral response. However, it must be recognized that many sounds that are heard by marine mammals may evoke no response. Some sounds may evoke aversive responses at low received levels, but all sounds will evoke aversive responses when the received levels are sufficiently high to be uncomfortable. At even higher levels, such sounds can cause physical injury.

Marine mammals have evolved over millions of years with exposure to a wide range of acoustic signals at various levels of sound. Much of this exposure is from biological sources. However, natural sounds produced by volcanism, lightning strikes and weather (wind and rain) also contribute to the natural noise floor of the ocean. Since many marine mammals rely on underwater sound for communication and echo-location, this would imply that they have very good hearing recognition and localization ability. It is also safe to assume that marine mammals cannot hear below the lowest background (ambient) noise level in the ocean and will not incur physical injury from sound levels that their ancestors likely experienced on an annual basis.

For marine mammals, a signal must be 10 to 15 dB above the ambient noise level (per Hertz) for it to be recognized. Unless a signal is perceived to be very close or threatening, another 10 to 20 dB increase in sound level would most likely be required to evoke behavioral reactions. For a 200-Hertz signal, average ocean ambient noise values range from 60 to 95 dB. Depending on background noise, for a marine mammal to hear and recognize a signal, it would have to be at a received level of 70 to 110 dB at the animal. At received levels of 80 to 130 dB, behavioral reactions are possible, depending on the characteristics of the signal. Sounds that portend lethal dangers, such as predators, ice breaks and marine mammal alarm calls, are likely to evoke strong behavioral reactions. In these examples, flight and interruption of significant biological behavior is almost a certainty. The 1997-98 SRP field experiment results show that blue, fin, humpback and gray whales did not perceive LFA signals as threatening.

When a sound is perceived as potentially dangerous, its loudness is probably not the overriding factor. The proximity of the signal to the marine mammal and the rate of approach are most significant in determining the immediacy of the threat. An example of the importance of source location was shown in the SRP Phase II experiments off the central California coast where a sound source was placed directly in the path of migrating gray whales, which follow a relatively predictable corridor close to shore. The animals showed a modest avoidance reaction by deflecting a few hundred yards around the sound source. When the sound source was moved one mile farther out to sea (even when the source level was adjusted so that the received level to the animals in the migration corridor remained the same) the whales did not exhibit avoidance of the signal.

In the absence of a threatening signal, marine mammals are not expected to alter their behavior unless and until sound levels become uncomfortable or significantly impair the perceptions of sounds that are critical for their behavior. Impairment of a marine mammal's perception of critical sounds is called masking. Masking effects in marine mammals caused by LFA would be temporary and negligible because LFA's bandwidth is limited to approximately 30 Hz, signals do not remain at a single frequency for more than 10 seconds, and the system is off at least 80 percent of the time. For humans, discomfort is highly dependent on the type of signal. Soft, mellow sounds are regarded as comfortable and sharp, pitched sounds (e.g., fingernails on a chalkboard) are uncomfortable. The SRP field study measured the response or, lack of response, of marine mammals to discomforting LFA sounds at exposure levels up to 155 dB. The onset of mild discomfort, for a 200 Hz signal lasting up to 100 seconds and transmitted approximately every 15 minutes, is estimated, using a human model in air, to be 50 to 60 dB above hearing threshold. This equates to approximately 130 to 140 dB received levels for baleen whales--the species believed to possess the best hearing capability in the LFA frequency band. For a 200 Hz signal lasting up to 100 seconds and transmitted every 15 minutes at 130 dB to 140 dB received levels, some marine mammals may temporarily avoid the sound, but more than likely will tolerate it. When the received level at the animal increases to approximately 165 dB, scientists estimate that up to 50% of baleen whales are likely to experience sufficient discomfort that they will take measures to avoid the sound. However, the reaction is dependent upon the behavior involved. If engaged in a critical behavior, such as feeding, they may choose to tolerate the discomfort for the nutritional benefit. If the sound received level reaches 180 dB, it is doubtful that animals will tolerate the signal for any reason. Above 180 dB, a 200 Hz signal lasting up to 100 seconds and transmitted every 15 minutes creates an increasing likelihood of injury as exposure levels rise. Included in this injury zone above 180 dB is the possibility of hearing loss and tissue damage from direct and resonance effects.

Extensive mitigation and monitoring requirements will be levied on all LFA operations. Geographic restrictions dictate that received levels will always be below 180 dB within 12 nautical miles of any coastline, and any NOAA and Navy-designated offshore biologically important area. Received levels will not exceed 145 dB in the vicinity of any known commercial or recreational dive sites. Monitoring mitigation procedures include daylight visual monitoring for marine mammals and sea turtles, passive listening with the SURTASS towed array to detect sounds generated by marine mammals as an indicator of their presence, and high frequency sonar to detect, locate and track marine mammals, and possibly sea turtles, near the LFA vessel to ensure they do not enter the 180-dB LFA Mitigation Zone.

The SRP field study results demonstrate that, while not impossible, the planned operations of LFA are highly unlikely to cause injury, especially given the operational restrictions and mitigation measures that will be employed in conjunction with all LFA operations. Extensive analysis has shown that a small number of animals will be exposed to levels above 165 dB, up to a maximum range from the source of approximately 30 nautical miles under optimal acoustic propagation conditions that may occur no more than 10 percent of the time. In general, exposure levels are more dependent on the depth of the animal than its range from the source. Therefore, the 30-nautical mile maximum needs to be tempered with the depth dependence of the sound field. Received levels up to 140 dB can range out to 300 nautical miles but, again, only under optimal conditions and assuming the animal is located in the narrow depth zone of highest sound level. At these ranges, the animal will move out of the small volume of high sound energy by simply changing depth. In ocean areas with water depths less than 4,000 feet, the ranges are significantly shorter (down to 10 percent of the above maximum ranges).

It is possible to *hear* LFA at long ranges. However, merely *hearing* the LFA signal does not constitute an impact--an important point that LFA opponents fail to acknowledge time and again. Given that the LFA signal does not seem to be intrinsically threatening or annoying to marine mammals, in the case of simply being able to hear the signal, the animal will necessarily be far from the source. Thus, it will not find itself within the area where a significant change to a biologically important behavior could occur; more than likely animals will have no reaction at these low exposure levels.

In summary, the potential impact on any stock of marine mammals from injury is considered negligible. The potential impact on any one marine mammal from significant change in a biologically important behavior--such as migrating, breeding, feeding, or sheltering--is considered minimal. Because there is some potential for incidental takes by harassment, the Navy is requesting a Letter of Authorization under the Marine Mammal Protection Act from NOAA Fisheries for the taking of marine mammals incidental to the employment of SURTASS LFA sonar. Additionally, the Navy is consulting with NOAA Fisheries under Section 7 of the Endangered Species Act.

The Navy's Long Term Monitoring Plan. As discussion of these three important points shows, the Navy has done the research and analysis that demosntrates that it can deploy this vitally needed ASW system safely and effectively. Findings from the SRP field-testing did not reveal any significant change in a biologically important behavior in marine mammals. Additionally, risk analysis conducted in the EIS estimated very low risk to marine mammal species. The Navy's planned long-term monitoring efforts go even further, with its commitment to future monitoring, and research on possible effects from underwater low frequency sound. Upon issuance of a Letter of Authorization by NOAA Fisheries, the Navy will provide a detailed Long Term Monitoring Plan, which will include:

1. Navy and independent scientific analyses of the effectiveness of the proposed mitigation measures, including verification of the high-frequency monitoring sonar performance.

2. Careful measurement and modeling of the LFA sound field at various depths and ranges prior to and during operations to ensure compliance with the 180-dB geographic restriction and the 145-dB diver criterion.

3. Additional research conducted in collaboration with other Navy oceanographic research laboratories and U.S. academia, such as Woods Hole Oceanographic Institution and Scripps Institution of Oceanography. The Navy will solicit the best-qualified independent marine biologists to help address the outstanding critical issues on the direct and indirect effects of man-made low frequency sound on marine mammal stocks. When security classification and SURTASS LFA ship operations scheduling allow, the Navy will encourage cooperative research efforts using SURTASS LFA sonar at sea.

4. Incident monitoring will comprise two parts. First, recreational and commercial diver incident monitoring, and secondly, marine mammal stranding incident monitoring. The Navy will maintain close coordination with the principal clearinghouses for information on diver-related incidents, namely the National Association of Underwater Instructors (NAUI), the Professional Association of Diving Instructors (PADI) and the Divers Alert Network (DAN). The Navy will also coordinate with NOAA Fisheries and the principal marine mammal stranding networks to correlate analysis of any whale strandings with LFA operations.

Some members of the general public have taken an intense interest in the problem of underwater noise, particularly focusing on SURTASS LFA. Unfortunately, the concern and controversy over the SURTASS LFA sonar system is largely based on misinformation that has appeared in the press, direct mail, the Internet, and during public hearings. Professional marine biologists and bio-acousticians believe there is reason for concern about higher noise levels in the ocean, but not for the kind of unreasoned fear that SURTASS LFA now generates in the general public. Therefore, I would like to address some of the misrepresentations of SURTASS LFA. For the record, I owe this part of my testimony to NOAA Fisheries.

1. LFA is the loudest human noise in the oceans, amounting to an acoustic holocaust. The maximum exposure an animal could possibly receive from LFA is 215 dB. This is not close to the loudest sound marine animals may be exposed to in their everyday environment. Each year about one trillion lightning strikes hit the ocean surface with sound levels around 260 dB. About 1,000 underwater earthquakes, landslides and volcanic eruptions exceeding 230 dB occur annually in the Pacific Ocean alone, and over 10,000 occur that exceed 205 dB. The loudest non-explosive anthropogenic noise in the ocean is from airgun arrays used in seismic exploration. There are about 150 seismic vessels operating worldwide this year, with source levels up to 255 dB, and capable of shooting every 10 seconds--any one of these can put more acoustic energy into the ocean annually than LFA. The most energetic noise in the oceans is from commercial shipping. If LFA and all other human-generated impulsive noises could be eliminated, noise levels would continue to rise because of shipping alone.

2. LFA is a billion times louder than a 747 jet engine. Within 200 yards, LFA is approximately the same as a 747 engine, if one could operate under water. Beyond 200 yards, LFA forms an omni-directional beam that is narrow in the vertical. Outside this beam, at any given distance, the LFA sound is comparable to a jet

engine at the same range. Inside the beam, LFA is about 30 dB louder, which would be perceived by a human as about six times louder, not a billion times.

3. The safety zone used for LFA, 180 dB received level, was invented for LFA, and is not based on science. The 180 dB safety zone was recommended by an expert panel in 1997 for seismic operations off California. Although it is true that no one study has proven the safety of this level for marine mammals, several lines of credible research suggest that 180 dB is a safe and conservative level for preventing injury from low frequency sound. Furthermore, the 180 dB level makes common sense, given the animals' environment. For example, 180 dB is about half the sound pressure level that an animal would receive from a nearby blue whale call, which is about 186 dB at the source.

4. Sonar has caused beaked whale deaths, which proves that LFA will also. It is not possible that all sonars will affect all species of marine mammals equally. Sonars differ in operating characteristics, and marine mammal species differ in the sounds to which they are susceptible. Opponents of LFA intentionally obscure these facts in an attempt to prove by analogy that LFA poses specific dangers. The scientific truth about sonar and beaked whales is that tactical sonar may be implicated in the strandings of six beaked whales on nearby beaches in the Bahamas in March 2000. They then apparently died from exposure. Tissues from two of the animals are being intensely studied by the Woods Hole Oceanographic Institution and NOAA Fisheries for the mechanism that could have caused their deaths. Six other episodes are known when sonar is believed to have operated near where beaked whales died. However, no tissues were collected from any of these events, and nothing is known about the types of sonar, or the time or distance separating them from the dead whales. Without this information, science cannot prove whether sonar did or did not cause whale deaths. These events are important because they point out the scientific truth about LFA -- that there is *no* evidence that LFA has *ever* caused a stranding, much less a mortality. Furthermore, its operation will come with extensive mitigation measures that will make strandings highly unlikely. It should be noted that *no* mitigation was used with any of the other seven events.

5. Resonance explains all previous stranding events caused by military sonar and makes deaths from LFA inevitable. Resonance is an untested hypothesis about the cause of the deaths of six beaked whales in the March, 2000 Bahamas stranding incident. Resonance is only one of three different hypotheses about the Bahamas strandings that NOAA Fisheries and the Navy are addressing. It should be noted that there are currently *no* resonance data available from *any* marine mammal tissue of *any* marine mammal species. Mathematical calculations leading to a hypothesis that resonance *might have* caused the beaked whale deaths in the Bahamas are not acceptable evidence that resonance *was in fact* the cause. Only physical experiments, now under way, can show whether resonance may be implicated in the whales' mortality. Until then, we should not assume that all active sonar can cause whale deaths by resonance.

In summary, the Navy recognizes that the potential impact of man-made sound in the ocean is an issue of public and scientific concern. The Navy cares about the ocean habitat, and its efforts are directed toward marine conservation. The environmentally responsible deployment of SURTASS LFA is an important Navy priority. The Final EIS demonstrates that LFA can be used safely relative to both human and marine life by restricting where and when it operates and by using validated mitigation measures. The Navy has relied on a group of independent scientists from respected scientific research establishments, such as Woods Hole Oceanographic Institution, Cornell University, the University of California and the University of Maryland. These are internationally recognized experts in bioacoustics and marine animal behavior. Their reputations are based on many years of impeccable research and personal scientific integrity. They deal in scientific fact, not emotional rhetoric and the facts show that the deployment of SURTASS LFA sonar can be safely employed in our oceans.

Finally, the Navy would like to add its support to the efforts of the Department of Commerce, NOAA, and NMFS to reauthorize the MMPA. The Navy will work with these and other federal agencies to ensure that any MMPA amendments proposed by the Administration will balance properly the goals of environmental protection and military readiness. The current definition of "harassment" is broken into two parts. The first part, known as "Level A" harassment, deals with physical injury to marine mammals. The second part, known as "Level B" harassment, deals with behavioral modifications to marine mammals. Under both parts, the potential to injure or disturb a marine mammal amounts to harassment of the marine mammal. Additionally, with regard to Level B harassment, the mere causing of a disruption to an animal's behavior patterns amounts to harassment. These overly broad and ambiguous terms allow for many naval activities, including operation of sonar, to be considered harassment. A recent National Research Council report to Congress recommended changes in the statutory definition of harassment. Changes along the lines of those recommended by the NRC could bring greater clarity to the MMPA, narrow the focus of harassment, and offer the Navy increased flexibility in its operations while still protecting marine mammals.

With regards to research, the Navy funds the majority of all Marine Mammal research in the world. The Navy provided approximately $7M in FY01 for research directly related to assessing and mitigating the effect of noise from Navy activities on the marine environment. The funding plan for FY02 calls for an increase of approximately $2M to $7M, contingent on final budget approval and recent events.

The Office of Naval Research (ONR) research program is divided into two major components: 1) Environmental Consequences of Underwater Sound (ECOUS) and 2) Effects of Sound on the Marine Environment (ESME). The goal of ECOUS is to develop data on marine animal hearing and behavioral response to sound with an emphasis on marine mammals as the group most likely to be sensitive to manmade noise, to encourage new technologies that will make this job easier (such as new listening technologies to detect marine mammal sounds) and to develop databases and educational resources to enable Navy personnel and the public to better understand and respond to this issue. ESME is a recent program that grew out of ECOUS, and has been funded at an annual level of about $2M since FY00. ESME is intended to take the information garnered from ECOUS, and other sources, and incorporate this information into a predictive modeling and planning toolkit for Navy and other users. The intent of ESME is to allow users to anticipate the likely outcome of a planned action, and design that action for minimal environmental impact.

Over half of the ONR program funds go outside the Navy to independent research institutions and universities. All participants in the program are encouraged to publish their results in peer-reviewed open professional literature, and to report their findings at open professional meetings in relevant subject areas (e.g. acoustics, animal behavior, hearing, ecology). The ONR program is externally reviewed by an independent board of visitors approximately once a year, and receives input from the National Academy of Sciences, the Marine Mammal Commission and other independent oversight bodies. A complete list of research activities sponsored in FY00-01, containing a 2-5 page summary of each project, can be found at the ONR website (www.onr.navy.mil).

In addition to the ONR S&T projects mentioned above, Navy invested $3M in
FY01 and is planning a similar amount in FY02 to take advantage of our years of experience in sonar operations and our knowledge of underwater sound in an attempt to monitor marine mammals. Equipment and techniques originally developed to detect the sounds emitted from submerged submarines may have practical application in detecting and tracking marine mammals. This has significant potential since many marine mammals use calls, sounds of a various nature when under the surface, as a form of social communication, or to determine the location of prey, etc.

Our attempts to detect these calls and determine what species of animal is calling, and under what circumstance may provide valuable information and understanding. First, we will be able to significantly improve our estimate of how many animals of a certain species are within a Navy ocean region of interest. This type data is critical to the analysis used to determine the potential effect of Navy operations on marine mammals. Second, we will be able to mitigate any potential effect by detecting the presence of a marine mammal within an area, and therefore cease or modify the scheduled operations.

Third, by acoustically monitoring marine mammals we may be able to measure any changes in their behavior providing information on the potential long-term effects from various Naval activities.

If it were possible to predict realistically how many marine mammals of a given species were expected in any given ocean region, Navy planners could, when there is an option, schedule training exercises at locations to limit any potential effect. A more realistic estimate of the number of animals expected must include knowledge of the factors which govern where marine mammal go in the ocean, and for what reasons. The Navy is investigating these habitats and attempting to correlate them with the known physical environment. When we have that information we will be able to predict or forecast marine mammal movement and abundance that will improve our ability to mitigate. The research to date has provided much insight on acoustic concerns in the ocean including the alarming overall rise of ambient noise and the potential masking of marine mammal communication by unregulated commercial shipping and seismic surveying.

The Navy is a good steward of the ocean and we have maintained a reasonable balance between national security and environmental concerns. We hope to continue that relationship as we forge ahead in this new century.